CLAIMS:

1. A charge storage device comprising:

a first electrode;

a second electrode being opposed to and spaced apart from the first electrode;

a porous separator disposed between the electrodes;

a sealed package for containing the electrodes, the separator and an electrolyte in which the electrodes are immersed; and

a first terminal and a second terminal being electrically connected to the first electrode and the second electrode respectively and both extending from the package to allow external electrical connection to the respective electrodes, wherein the gravimetric FOM of the device is greater than about 2.1 Watts/gram.

2. A device according to claim 1 including a gravimetric FOM in one of the following ranges:

about 2.5 Watts/gram to 3 Watts/gram; or

about 3 Watts/gram to 3.5 Watts/gram; or

about 3.5 Watts/gram to 5 Watts/gram; or

greater than about 5 Watts/gram.

3. A device according to claim 1 wherein the first electrode and the second electrode form a capacitive cell and the device includes a plurality of like cells disposed within the package, each cell being electrically connected in either parallel or series with one other cell in the package.

4. A device according to claim 3 wherein the maximum operating voltage of the or each capacitive cell is in the range of:

about 3.5 Volts to 4 Volts; or

about 3 Volts to 3.5 Volts; or

less than about 3 Volts.

5. A device according to claim 1 wherein the first electrode and the second electrode include a first carbon coating and a second carbon coating respectively wherein the surface area of the carbon used in the coatings is greater than 20 m^2/gram.

6. A charge storage device comprising:

a first electrode;

a second electrode being opposed to and spaced apart from the first electrode;

a porous separator disposed between the electrodes;

a sealed package for containing the electrodes, the separator and an electrolyte in which the electrodes are immersed; and

a first terminal and a second terminal being electrically connected to the first electrode and the second electrode respectively and both extending from the package to allow external electrical connection to the respective electrodes, wherein the volumetric FOM of the device is greater than about 3.2 Watts/cm^3.

7. A device according to claim 6 having a volumetric FOM in the range of:

about 3.2 Watts/cm^3 to 4 Watts/cm^3; or

about 4 Watts/cm^3 to 5 Watts/cm^3; or

about 5 Watts/cm^3 to 7 Watts/cm^3; or

about 7 Watts/cm^3 to 8 Watts/cm^3.

8. A charge storage device including:

a first electrode having a first conductive substrate;

a first carbon layer supported on the first substrate and being formed from a carbon having a surface area greater than 400 m^2/gram;

a second electrode having a second conductive substrate;

a second carbon layer supported on the second substrate and being formed from a carbon having a surface area greater than 400 m^2/gram;

a porous separator disposed between the electrodes;

a sealed package for containing the electrodes, the separator and an organic electrolyte in which the electrodes are immersed, wherein the first and second layers are opposed and spaced apart; and

a first terminal and a second terminal being electrically connected to the first electrode and the second electrode respectively and both extending from the package to allow external electrical connection to the respective electrodes, wherein the volumetric FOM of the device is greater than about 1.1 Watts/cm^3.

9. A device according to claim 8 wherein the surface area of the carbon is at least 1200 m^2/gram.

10. A device according to claim 8 wherein at least one of the layers contains more than one type of carbon.

11. A charge storage device comprising:

a first electrode;

a second electrode being opposed to and spaced apart from the first electrode;

a porous separator disposed between the electrodes;

a sealed package for containing the electrodes, the separator and an electrolyte in which the electrodes are immersed; and

a first terminal and a second terminal being electrically connected to the first electrode and the second electrode respectively and both extending from the package to allow external electrical connection to the respective electrodes, wherein the response time (T_o) of the device is less than about 0.09 seconds.

12. A device according to claim 19 wherein T_o is in the range of:

about 0.09 seconds to 10^{-2} seconds; or

about 10^{-2} seconds to 10^{-3} seconds; or

about 10^{-3} seconds to 10^{-4} seconds; or

less than about 5×10^{-5} seconds.

13. A charge storage device including:

a first electrode;

a second electrode being opposed to and spaced apart from the first electrode;

a porous separator disposed between the electrodes;

a sealed package for containing the electrodes, the separator and an electrolyte in which the electrodes are immersed; and

a first terminal and a second terminal being electrically connected to the first electrode and the second electrode respectively and both extending from the package to allow external electrical connection to the respective electrodes, wherein the gravimetric power maximum of the device is greater than about 12.5 Watts/gram.

14. A device according to claim 13 having a gravimetric power maximum in the range of:

about 12.5 Watts/gram to 15 Watts/gram; or

about 15 Watts/gram to 17 Watts/gram; or

about 17 Watts/gram to 26 Watts/gram; or

greater than about 26 Watts/gram.

15. A charge storage device including:

a first electrode;

a second electrode being opposed to and spaced apart from the first electrode;

a porous separator disposed between the electrodes;

a sealed package for containing the electrodes, the separator and an electrolyte in which the electrodes are immersed; and

a first terminal and a second terminal being electrically connected to the first electrode and the second electrode respectively and both extending from the package to allow external electrical connection to the respective electrodes, wherein the volumetric power maximum of the device is greater than about 35 Watts/cm^3.

16. A charge storage device comprising:

a first electrode;

a second electrode being opposed to and spaced apart from the first electrode;

a porous separator disposed between the electrodes;

a sealed package for containing the electrodes, the separator and an electrolyte in which the electrodes are immersed; and

a first terminal and a second terminal being electrically connected to the first electrode and the second electrode respectively and both extending from the package to allow external electrical connection to the respective electrodes, wherein the time constant of the device is less than about 0.03 seconds.

17. A device according to claim 16 having a time constant in the range of:

about 0.03 seconds to 10^{-2} seconds; or

about 10^{-2} seconds to 10^{-3} seconds; or

about 10^{-3} seconds to 10^{-4} seconds; or

about 10^{-4} seconds to 10^{-5} seconds; or

less than about 10^{-5} seconds.

18. A charge storage device comprising:

a plurality of first sheet electrodes having respective first tabs extending therefrom;

a plurality of second sheet electrodes alternated with the first electrodes and having respective second tabs extending therefrom;

a porous separator disposed between adjacent electrodes; and

a sealed package for containing the electrodes, the separator and an electrolyte, whereby the first tabs are electrically connected to a first terminal and the second tabs are electrically connected to a second terminal, both the first and second terminals extending from the package to allow external electrical connection to the respective electrodes.

19. A charge storage device comprising:

a first sheet electrode;

a second sheet electrode disposed adjacent to the first electrode, whereby the electrodes are folded back upon their respective lengths;

a porous separator disposed between adjacent electrodes; and

a sealed package for containing the electrodes, the separator and an electrolyte, whereby the first electrode is electrically connected to a first terminal and the second

electrode is electrically connected to a second terminal, both the first and second terminals extending from the package to allow external electrical connection to the respective electrodes.

20. A multiple charge storage device comprising:

a first electrode being electrically connected to a first terminal;

a second electrode disposed adjacent the first electrode and being electrically connected to a second terminal;

a third electrode disposed adjacent to the first electrode and being electrically connected to the second terminal;

one or more porous separators disposed between adjacent electrodes; and

a package for containing the electrodes, the one or more separators and an electrolyte, whereby the terminals extend from the package to allow external electrical connection to the respective electrodes.

21. A multiple charge storage device comprising:

a package defining a sealed cavity containing an electrolyte;

two spaced apart capacitor terminals each extending between a first end located within the cavity and a second end external to the package;

a first capacitor cell located within the cavity and being in contact with the electrolyte, wherein the first cell has both a first predetermined time constant and two cell terminals which are electrically connected to respective capacitor terminals; and

a second capacitor cell located within the cavity and being both in contact with the electrolyte and maintained in a spaced apart configuration with respect to the first

cell, the second cell having both a second predetermined time constant and two cell terminals which are electrically connected to respective capacitor terminals.

22. A multiple charge storage device comprising:

a first sheet electrode being electrically connected to a first terminal and having a first coating on at least one side thereof, the coating being of predetermined varying thickness;

a second electrode disposed adjacent to the first electrode and being electrically connected to a second terminal;

one or more porous separators disposed between adjacent electrodes; and

a package for containing the electrodes, the one or more separator and an electrolyte, whereby the terminals extend from the package to allow external electrical connection to the respective electrodes.

23. A multiple charge storage device comprising:

a first sheet electrode being electrically connected to a first terminal and comprising a first coating on one side thereof and a second coating on the other side thereof, the first coating being of a first predetermined thickness and the second coating being of a second predetermined thickness;

a second sheet electrode being electrically connected to a second terminal and disposed adjacent to the one side of the first electrode, wherein the second electrode includes a third coating on one side thereof of a third predetermined thickness, the third coating being opposed to the first coating;

a third electrode being electrically connected to the second terminal and disposed adjacent to the other side of the first electrode, wherein the third electrode

includes a fourth coating on one side thereof of a fourth predetermined thickness, the fourth coating being opposed to the second coating;

one or more porous separators disposed between adjacent electrodes; and

a package for containing the electrodes, the one or more separators and an electrolyte, whereby the terminals extend from the package to allow external electrical connection to the respective electrodes.

24. Electrodes for use in a supercapacitor, the electrodes comprising:

a substrate; and

carbon particles mixed with a suspension of protonated carboxy-methyl-cellulose coated on the substrate.

25. A supercapacitor comprising:

at least one pair of electrodes having a mixture of carbon particles and a suspension of protonated carboxy-methyl-cellulose coated on facing surfaces of the at least one pair of electrodes;

a separator positioned between said facing surfaces of said at least one pair of electrodes; and

an electrolyte for wetting the separator.

26. A charge storage device including:

a first electrode having a first layer formed from a non-foamed carbon;

a second electrode having a second layer formed from a non-foamed carbon, the second layer being opposed to and spaced apart from the first layer;

a porous separator disposed between the electrodes;

a sealed package for containing the electrodes, the separator and an electrolyte in which the electrodes are immersed; and

a first terminal and a second terminal being electrically connected to the first electrode and the second electrode respectively and both extending from the package to allow external electrical connection to the respective electrodes, wherein the surface area of the carbon used to form the first and second layers is greater than 20 m^2/gram.

27. A charge storage device including:

a first electrode having a first substrate and a first carbon layer supported by the substrate, the layer being formed from a carbon having a surface area of at least about 400 m^2/gram;

a second electrode having a second substrate and a second carbon layer supported by the second substrate, the second layer being formed from a carbon having a surface area of at least about 400 m^2/gram, the second layer being opposed to and spaced apart from the first layer;

a porous separator disposed between the electrodes;

a sealed package for containing the electrodes, the separator and an electrolyte in which the electrodes are immersed; and

a first terminal and a second terminal being electrically connected to the first electrode and the second electrode respectively and both extending from the package to allow external electrical connection to the respective electrodes, wherein the gravimetric power maximum of the device is greater than about 4.8 Watts/gram.

28. A device according to claim 44 wherein the surface area of the carbon is at least 1200 m^2/gram.

29. A device according to claim 44 wherein at least one of the layers contains more than one type of carbon.

30. A energy storage device including:

a housing;

a first and a second opposed electrodes having respective first and a second charge storage capacities, the electrodes being disposed within the housing and the first charge storage capacity being greater than the second charge storage capacity;

a separator intermediate the electrodes; and

an electrolyte disposed within the housing for transferring charge with the electrodes.

31. A device according to claim 30 wherein the first electrode includes an aluminium sheet having a first carbon coating on one side thereof and the second electrode includes an aluminium sheet having a second carbon coating on one side thereof wherein the first and the second coatings are opposed.

32. A device according to claim 31 wherein the sheets are substantially dimensionally equivalent and the charge storage capacities vary due to differences between the first coating and the second coating.

33. A device according to claim 32 wherein the first coating is thicker than the second coating.

34. A device according to claim 32 wherein the specific capacitance of the first coating is greater than that of the second coating.

35. A device according to claim 30 wherein the charge storage capacities are different due to a difference in surface area of the first and second electrodes.

36. A charge storage device including:

a housing;

a first sheet electrode disposed within the housing;

a second sheet electrode disposed within the housing adjacent to and opposed with the first sheet electrode;

a separator for enveloping substantially all of the first electrode and for maintaining the electrodes in a spaced apart configuration;

an electrolyte disposed intermediate the electrodes; and

two terminals extending from the respective electrodes and terminating outside the housing for allowing external electrical connection to the electrodes.

37. A device according to claim 36 wherein the separator includes two opposed separator sheets which are connected along at least one common edge and the first electrode is disposed between the separator sheets.

38. A device according to claim 37 wherein the separator sheets are integrally formed.

39. A device according to claim 38 wherein the separator sheets are integrally formed along the common edge.

40. A device according to claim 39 wherein each separator sheet includes a first edge and a second edge spaced apart from the first, both of which extend away from the common edge.

41. A device according to claim 40 wherein each separator sheet also includes a third edge which extends between the first edge and the second edge, wherein the first

edges are opposed and joined together and the second edges are opposed and joined together.

42. A device according to claim 41 wherein the third edges are opposed.

43. A device according to claim 42 wherein the first electrode includes a first sub-sheet and a second sub-sheet which is opposed to the first.

44. A device according to claim 43 wherein the first and the second sub-sheets are opposed.

45. A device according to claim 44 wherein each of the first and second sub-sheets are joined along a common edge.

46. A device according to claim 45 wherein the common edge between the first and second sub-sheets is disposed adjacent to the common edge between two opposed separator sheets.

47. A charge storage device including:

two opposed electrodes having respective coatings of carbon particles, the particles having a predetermined nominal diameter and the coatings having of a thickness greater than but in the order of the nominal diameter;

a porous separator disposed between the electrodes;

a sealed package for containing the electrodes, the separator and an electrolyte in which the electrodes are immersed; and

a first terminal and a second terminal being electrically connected to the first electrode and the second electrode respectively and both extending from the package to allow external electrical connection to the respective electrodes.

48. A device according to claim 46 wherein the predetermined nominal diameter is less than about 8 microns and the coating thickness is less than 100 microns.

49. A device according to claim 46 wherein the predetermined nominal diameter is less than about 6 microns and the coating thickness is less than about 36 microns.

50. A device according to claim 46 wherein the predetermined nominal diameter is less than about 2 microns and the coating thickness is less than about 6 microns.

51. A method of manufacturing a charge storage device, the method including the steps of:

opposing two electrodes having respective coatings of carbon particles, the particles having a predetermined nominal diameter and the coatings having of a thickness greater than but in the order of the nominal diameter;

disposing a porous separator between the electrodes;

containing in a sealed package the electrodes, the separator and an electrolyte in which the electrodes are immersed; and

electrically connecting a first terminal and a second terminal to the first electrode and the second electrode respectively for extending from the package to allow external electrical connection to the respective electrodes.